IJARSE
ISSN 2319 - 8354

ANALYSIS ON PERFORMANCE IMPROVEMENT OF A TRACTOR ENGINE TESTING UNIT

Shikhar Jamuar[1], Subbarao Chamarthi[2], Shivam Goyal[3], Soubhagya Ranjan Dhall[4]

[1,2,3,4]*Student, Mechanical Engineering Department, SRM University, Delhi-NCR Campus*

ABSTRACT

This paper provides an overview of possibilities for determining tractor's engine load, fuel consumption and exhaust emissions in real operating conditions. The use of accumulated database in tractor's electronic control modules for the analysis of engine load, fuel consumption and exhaust emissions is analysed. The methodology for analysis of engine power, speed and exhaust emissions dependencies, also for analysis of engine exhaust emissions is presented. This speeds up the process, reduces cycle time and increases efficiency of the process. After these operations the Engine is ready. Now after these operations Engine is forwarded to the Test Shop. There is a complete testing setup for every engine that comes out of the main assembly line. Here engine is thoroughly checked for its working and any possible faults such as engine noise, rpm, loading, leakages, exhaust smoke etc.

Keywords: Cycle time, Engine load, Exhaust Emission, Fuel consumption, Loading.

I. INTRODUCTION

A tractor is a source of power under stationery and mobile conditions. Therefore, the first step of its performance evaluation is to determine the maximum power and torque together with SFC and variation of these characteristics over the entire governed speed range. The engine BHP has no importance to the user, as he is concerned with the power available at the power outlets of the tractor and therefore in laboratory the power is measured at all the power outlets viz. Power take-off shaft, belt pulley, drawbar and hydraulic lift. In the initial stages of the agricultural mechanisation process, many poorly designed and poorly manufactured machines may be put on the market. This situation poses serious problems at both the individual and the national level. Official testing of agricultural machinery was started with the primary objective of eliminating poorly designed and poorly manufactured machinery. It must however be remembered that, at the same time, testing tends to upgrade the technical level on the manufacturer's side, thereby contributing to marked improvements in the performance and durability of agricultural machinery.

IJARSE
ISSN 2319 - 8354

Fig. 1: display for engine testing unit.

Every Industry has separate engine testing department. There is a complete testing setup for every engine that comes out of the assembly line. Here engine is thoroughly checked for its working and any possible faults such as

- Engine noise
- RPM
- Loading
- Leakages
- Exhaust Smoke

Different models of engine can be tested in the engine-testing department, the test beds may vary in design and size but more less are capable of the complete testing. There are different levels of tests. Some are optional and others are compulsory, but the basic test procedure remains the same few step in and out don't matter. The test report comprises of four sections namely:

- Specifications: Test engineers verify measurements and specifications to make sure everything is congruent with the manufacturer's specifications.
- Test Conditions: Engineers record the exact test conditions of the test engine to ensure that conditions meet the requirements of the test procedure.
- Compulsory Tests: Engineers record the performance of the engine at the main power take-off, the power lift and hydraulic pump, and the drawbar. Included in the drawbar tests and PTO tests are fuel consumption measurements.
- Water leakage section: Check Cylinder Head rear plate. Water pump, Head Gasket, Water Plug, Drain Plug and Oil Leakage: Check Tappet Cover, Cylinder Head Gasket , Front rear half moan joint , Sump joint , Timing Case cover , Rear end oil seal , Oil filter , Drain plug , PTO plate , Pressure pipe and elbow pipe and Timing case cover seal.
- Gears and Knocking: Check Missing and Vibration. Or any types of disturbance which create in engine are rectifying in the Department and forwarded to the Test S

II. PROCEDURE OF ENGINE TESTING UNIT

The procedure for engine testing is mentioned below.

- Engine oil is poured into the engine
- Engine is fixed in the mounting points
- The intake and exhaust are connected to the supply and draw line
- The hot water supply is connected
- The flywheel of the engine is connected to the rotor of the dynamometer
- The engine is turned on using an electrical switch
- And is run on idle RPM for some time
- Then after some time the engine is shifted to max throttle
- By Appling load using a dynamometer the rpm is brought down to 2200
- And the further brought down to 1200rpm
- The engine speciation values are noted against these rpm and matched with a specification sheet issued by the R&D department

If the values are under the specified limits then is OK otherwise it is REJECTED or kept on HOLD

2.1 Parameters of Engine Testing

- Oil temperature
- Water inlet temperature
- Oil pressure
- Fuel time (mileage)
- Water outlet temperatur
- Air temperature

2.2Engine Testing Device

The device used for engine testing is called dynamometer. The there are many types of dynamometer broadly.

- Hydraulic dynamometer
- Eddy current dynamometer
- Switching field dc dynamometer
- Fan dynamometer
- Transmission dynamometer
- Chassis dynamometer

The device specifically used for our testing at the laboratories is Eddy current dynamometer.

2.3 Working Of An Eddy Current Dynamometer

- In this type load is applied to the engine by eddy current principle
- Dynamometer consist of stator and rotor
- Rotor is connected with shaft to engines flywheel
- Stator is nothing but a coil winding which is connected with a constant

International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 10, October 2017
www.ijarse.com
IJARSE
ISSN 2319 - 8354

- 440v supply with varying current (0-15amp)
- The current varies from 0-15 to control the engine load 0-250NM

III. FIGURES AND TABLES

The following observations are made for the Engine test cycle and noticed the respective Step time and Cumulative time as observed and given below:

TABLE 1. Engine test cycle and respective Step time and Cumulative time

ENGINE TEST CYCLE	STEP TIME (MIN)	CUM TIME (MIN)
Loading and engine start	7	7
Open rocker cover, check oil coming in rocker shaft	3	9
Running in	2	10
Running in	3	12
Running in	5	16
Cylinder head & tappet setting	6	21
Running in	5	26
check HL and set if required	3	28
Performance testing& fuel adjustment if required	5	32
Performance testing& fuel adjustment if required	3	33
Performance testing& fuel adjustment if required	3	35
Check LI &set if required	2	38
Engine stop and unloading	4	38

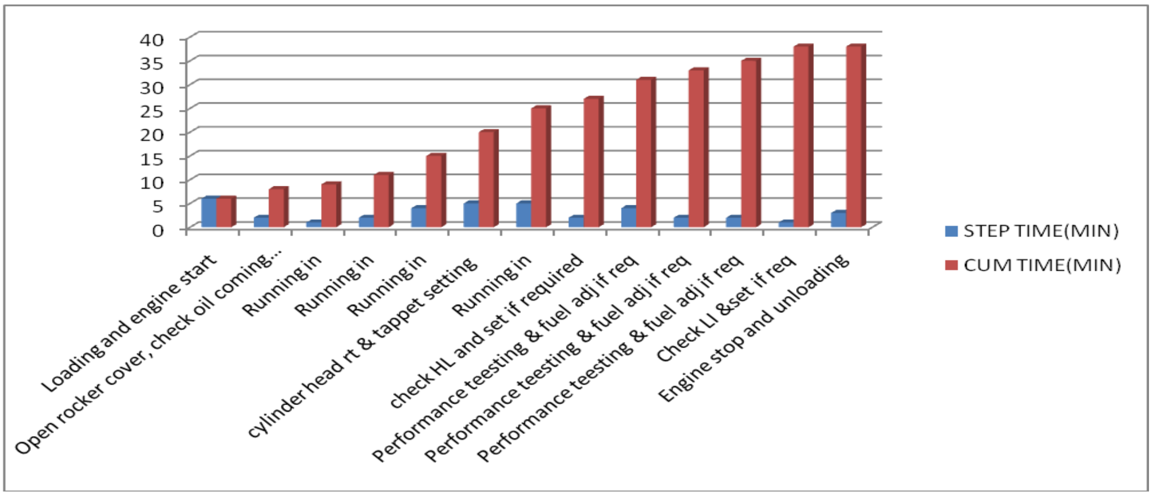

Fig 2. Graph for step time and cum time for different processes

Apart from these the engine testing parameters for five different working models were anlayzed and the results are mentioned below:

TABLE 2. Analasys for different engine models

Engine Testing Parameters	Model 1	Model 2	Model 3	Model 4	Model 5
Loading and engine start	0	0	0	0	0
Open rocker cover, check oil coming in rocker shaft	0	0	0	0	0
Running in	0	0	0	0	0
Running in	48	41	44	34	42
Running in	96	82	88	68	84
cylinder head & tappet setting	0	0	0	0	0
Running in	144	123	132	102	126
check HL and set if required	0	0	0	0	0
Performance testing& fuel adjustment if required	159	129	139	109	129
Performance testing& fuel adjustment if required	159	129	139	109	129
Performance testing& fuel adjustment if required	159	129	139	109	129
Check LI &set if required	0	0	0	0	0
Engine stop and unloading	0	0	0	0	0

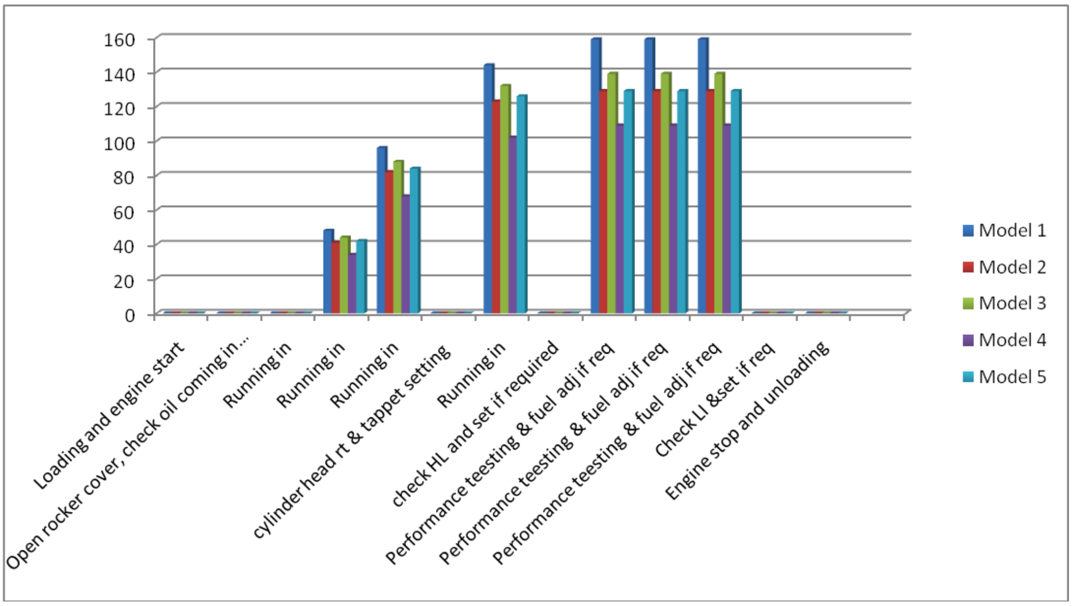

Fig.3 Graph for the Processes For Different Model Engines

IV. CONCLUSION

This work reports the test bed set-up used for the evaluation of the performance of Tractor engines. The procedure has proven to be reliable and robust and allows obtaining also a series of additional parameters describing the engine performance. The described testing procedure allows investigating both a single parameter's value, and also the whole operating performance of an engine. The use of this Research paper allows investigating the entire acquisitions with reduced post processing time. This test stand with the described post processing procedure will be used in the future works to evaluate the performance of traditional and alternative fuelled ICEs for both agricultural and co-generative applications.

REFRENCES

[1] B. Shadidi, T. Yusaf, H.H.A. Alizadeh and B. Ghobadian. 2014. Experimental investigation of the tractor engine performance using diesohol fuel, Appl. Energy. 114: 874–879.

[2] S. Ahmed, M.H. Hassan, M.A. Kalam, S.M. AshrafurRahman, M.J. Abedin and A. Shahir. 2014. An experimental investigation of biodiesel production, characterization, engine performance, emission and noise of Brassica juncea methyl ester and its blends, J. Clean. Prod. 79: 74–81.

[3] J J. Pullen, K. Saeed. 2014. Factors affecting biodiesel engine performance and exhaust emissions - Part II: Experimental study, Energy. 72: 17–34.

[4] K. Nikzadfar, A.H. Shamekhi. 2014. Investigating the relative contribution of operational parameters on performance and emissions of a common-rail diesel engine using neural network, Fuel. 125: 116–128.

[5] S. S.N. Pang, G.C. Zoerb and G. Wang. 1985. Tractor monitor based on indirect fuel measurement, Trans. ASABE. 28: 994–998.

[6] D. Friso. 1988. Modellomatematico per l'ottenimentorapido del piano quotatodeiconsumi di unmotore diesel [Mathematical model to obtain quickly the contour map of diesel engine specific fuel consumptions], Riv. Di Ing. Agrar. 1: 56–61.

[7] K. Kar, S. Roberts, R. Stone, M. Oldfield and B. French. 2004. Instantaneous exhaust temperature measurements using thermocouple compensation techniques, SAE Tech. Pap. 2004-01-1418.